it because of bloody disputes between the Shammar and Tay tribes. The land is poorer than in the north and the rainfall is much scarcer. Farmers who managed to plant barley on the fringes of the disputed land in the bad year of 1951 lost heavily. It is improbable that an average year would give much hope of profit.

Ras el Ain, though on the railway line, has less rainfall than Kamishli, Amuda, or Dirbassiya because the mountains recede north into Turkey. Dry farming is profitable less than 20 kms. south of Ras el Ain.

IV. The Khabur Valley

The Khabur river, though rising in Turkey, is fed by springs in Ras el Ain and flows southward for about 150 kms. within the Jazirah before it enters the Mohafaza of the Euphrates below Markada.

For about 20-30 kms. below Ras el Ain, the land is used for cereals, mainly barley, with varying degrees of success. But south of this area and down to Hassakeh, dry cultivation becomes risky. South of Hassakeh and to the east and west, dry cultivation becomes entirely out of the question because rainfall, already insufficient at Hassakeh, falls off sharply.

The inadequate rainfall is offset to a certain extent by the possibility of irrigation from the Khabur. Traces of old dams are apparent in several places, and canals which carried the waters from the dams are visible. History and legend leave no doubt that the valley was much more extensively exploited in former times than it is now.

Recently, when the price of rice rose during the War, farmers from the cities of Jazirah in search of irrigated land, began renting lands along the Khabur and installing motors and pumps. The necessary outlay of capital for any project of adequate size was substantial, not less than LS 150,000, and the price of rice fell after 1946, so that perhaps not more than fifty irrigation projects existed up to 1949. It remained for the cotton boom of 1951 to boost this number to around 200 pumps.

The average size of pumps is 8" and the area irrigated by a pump of this size is around 500 dunums (125 acres). On some projects, where land is available, this area for summer crops is supplemented by an area twice this size in wheat and barley. But lands on both sides of the river rise steeply and rarely can an owner of an irrigation project find enough lands to use the pumps

183 makes it the biggest river in Syria after the Euphrates. A short description of the Khabur valley was given earlier and the great possibilities of the river remain undeveloped. Unlike the Euphrates, especially in its lower reached, the Khabur valley is narrow. The alluvial plain does not extend more than five hundred meters on each bank in most places and then the land rises to a height of 10-50 meters over a distance of several kilometers.

812 406 The alluvial plain along each bank has been more or less irrigated and planted by primitive methods such as the kard and the naqourah or dulab since old times. The kard can irrigate about fifteen dunums and the naqourah, if in good condition, can produce a flow of less than two inches of water and raise it to a height of a maximum six meters which is the diameter of the wheel. More prosperous Bedouins combine two or three naqourahs on the same axis and get a flow of about 3-5 inches. The naqourah is evidently a cheap way to raise water, but its construction is costly. Assuming that a Bedouin wants to build a naqourah on a new site, he has to erect a sort of a dam with stones on about half the river's width to raise the river's level and direct its flow towards his naqourah. Since stone is not abundant along the Khabur and has to be carried long distances, it becomes the job of specialized carpenters to construct the wheel, erect its supports, and balance it. This may cost another LS 1,500. The carpenter who constructs the wheel or naqourah becomes responsible for its maintenance and is paid yearly 11 percent of the yield of the land irrigated in lieu of wages.

2441 The staple crops of the Khabur were formerly wheat in winter and sorghum in summer. Sorghum was prefeered to every other summer crop because it provides food for both man and beast. Lately, the naqourah peasants began planting sesame and in the last two years cotton, but reverted this year to sorghum and sesame as the main summer crops.

511 2441 427 Unlike the Kurdish or even the Bedouin peasant of northern Jazirah, the Khabur peasant is very poor and primitive. Rarely does he own one cow to use for plowing. Usually two or more farmers join to provide one team. For this reason the strip of land which he can cultivate for wheat or sesame does not exceed 20-30 dunums, of which half the yield goes to the owner of the land who provides water. This is to compare with 250-300 dunums cultivated by the Kurdish farmer, of which he has to pay only the rent of the combine for the harvest.

7:Lewis S-5 (ca. 1940-45) 1948 MD1 Syria MD1

241 except wheat and barley, and around each village is an area of irrigated land on which vegetables, fruit, cotton, maize, fodder, and grain are grown. The configuration of the ground and the peculiar properties of the marl make possible the use of subsurface water for irrigation, and past and present inhabitants have taken full advantage of these conditions.

312 Water is distributed to irrigation ditches from wells, surface watercourses, or *foggaras* (foqqaras).[2] It is lifted from wells either by pumps or by chains of buckets geared to an animal-turned wheel. From wadis which have water in part of their course for some or all of the growing season it is taken by a gravity canal. The stream is roughly dammed and the water led, at a gentler angle than that of the watercourse, along the valley side until it reaches a suitable level for watering the ground below. Neither of these methods is of great importance as compared with foggaras, which supply most of the irrigated lands of the area.

A foggara, known elsewhere as *qanat*, *kariz*, or "chain of wells," is an underground conduit. The method has been used since ancient times in many parts of the Middle East. Foggaras are found in several regions of Syria and are especially numerous in the Selemiya region. Figure 4 shows the general principle by which the water-bearing layer is tapped by the gallery or subsurface canal. The most copious supplies of water are provided when the canal is driven back from a spring along the underground "stream" that feeds it. A depression that is a natural gathering ground of water is often utilized, or a wide area may be tapped by the construction of several converging galleries, as in Moufaqqar. The gradient of the gallery is sufficient to induce water flow, but it is less steep than the general slope of the ground, so that water is conducted gradually to the surface, usually to low-lying flat land suitable for irrigation. The vertical shafts, like large wells, which connect the underground canal to the surface, were used during the digging as passages of ingress and egress and serve the same purpose now when the canals are cleaned of mud, debris, and vegetation; hence they are always surrounded with mounds of accumulated spoil. Lower down, as the canal comes to the surface, it flows between steep banks, which gradually become less high, until the water is flowing at ground level. Often the hardpan forms a natural roof to the gallery.

In length, depth, and water flow the foggaras differ greatly. One canal

[2] Foggaras in North Africa have been described and illustrated in the *Geographical Review*. See 113 Jules Blache: Modes of Life in the Moroccan Countryside, Vol. 11, 1921, pp. 477–502, references on pp. 488 and 491; R. H. Forbes: The Transaharan Conquest, Vol. 33, 1943, pp. 197–213, reference on p. 199—EDIT. NOTE.

14:International Bank S-5 (1954) 1955 MD1 Syria MD1

491 623 districts without the resources necessary for the most ordinary upkeep. A wider use of road gangs would achieve far better maintenance, for the same expenditure, than is possible with the prevailing "one-man" system. A team concentrating upon a section at a time can often effect repairs which one man alone cannot do at all; gangs also permit closer technical supervision and more efficient use of equipment—valuable considerations when the supply of both is limited.

Road Maintenance Equipment

491 496 The country as a whole has far too little road-building and maintenance machinery for effective work. Mechanization must of course be introduced gradually where so much of the work is now done by hand. The present stock of equipment cannot meet even current needs. Half the mixers in the Damascus area are unusable, for example. There are no graders or bulldozers for maintenance purposes, although at least ten are needed for the tracks alone.

It is not enough to expect that construction machinery will be assigned to maintenance afterward; much of it will be worn out on the contemplated road-building program. Maintenance machinery should be bought separately. For one or more stone-crushing plants, the necessary bulldozers and graders, new rollers and other equipment needed currently, the mission foresees an expenditure of £S 1 million in the first five-year period and twice this amount in the second five years.

D LEGISLATION ON THE USE OF ROADS

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Traffic Laws

Syria enacted a modern, comprehensive traffic code in 1953, which contains the usual detailed regulations on vehicle dimensions, maximum wheel loading, weight limits for certain types of roads and bridges, and similiar provisions for protection of the roads. It also provides for periodic inspection of vehicles for mechanical fitness. Rules of the road for safe and courteous driving are prescribed, as well as the knowledge required for obtaining a driver's permit.

The code is essentially a good one, and it is regrettable that most of its provisions are ineffective because of poor enforcement. Apart from the danger to human life, unless better measures are taken to enforce the

29:Dunn S-4 (1952)1952 MI Middle East
Syria MDI

241 possibilities for expanding the total area under cultivation, for improving and increasing irrigation, and for increasing productivity through research and education. They also point to needed improvements in agricultural equipment, in agricultural credit, and in the land tenure system.

241 311 Although estimates vary as to the amount of new land which can be brought into cultivation, all agree that it is possible to double the present planted acreage. Cultivation could be extended in some dry-land areas with improved rotation and fertilization, but in most cases new land can be brought into cultivation only by extending irrigation.

IRRIGATION

241 312 Information which the United States Legation at Damascus has prepared from reports of the Syrian Ministry of Public Works indicates a total of about 2.4 million acres under irrigation at the present time, of which approximately 60 per cent is from gravity flow and the remainder from pumps of various sorts. Some of the Ministry's data are said to be based on actual surveys, some on interviews, and some simply on estimates. This 2.4 million

241 312 406

The most common system of irrigation in the new cotton areas of the Jezira is to draw water like this from streams with pumps powered by diesel engines. The number of pumps in Syria has doubled since 1950.

312 Lebanon mountains. It flows by gravity through tunnels to the waterworks in the city, from which it is distributed to the individual houses or, in the more congested districts, to public fountains. The overflow 312 is discharged into the Barada River. The 314 supply is not treated, but its purity is checked daily at 'Ain el Fije, and samples are submitted twice a week to the government laboratories for bacteriologic and chemical examination. The water of the Barada River is no longer used for domestic purposes, being reserved for other municipal requirements.

Untreated water from a spring-fed reservoir supplies the city of Aleppo. The present supply is inadequate, and plans have been projected to conduct water from the Euphrates River to a plant near Aleppo, where it will be treated by sedimentation and 312 chlorination before distribution. Hama obtains most of its supply from wells linked by tunnels, but part of the town depends upon an ancient system in which the water 312 is lifted from the Orontes River by means 406 of huge water wheels and distributed in open overhead aqueducts. These wheels, or *na'ourat*, are operated by the force of the current and collect the water in buckets attached at intervals around their circumference. They are often utilized in small irrigation works, where the river is situated below the level of the surrounding plain.

312 Simple methods of irrigation are practiced in many districts bordering the larger rivers. The Al Ghouta, or oasis of Damascus, has been irrigated by the Barada River and its tributaries for centuries: some of the canals have undoubtedly existed since 312 Roman times. Pumps are sometimes em- 406 ployed in the Al Jazira region, while *na'ourat* are common in certain sections along the banks of the Orontes, the Eu- 312 phrates and the Khabour rivers. Several large irrigation projects have recently been undertaken under the supervision of the Ministry of Agriculture. These include the irrigation of over 35,000 acres in the Homs-Hama region and the drainage of portions

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